

REMARKS

Amendments

Claim 36 is amended to depend from claim 26, rather than claim 34.

Rejection under 35 USC §112, second paragraph

As noted above, claim 36 is amended to depend from claim 26, rather than claim 34. Claim 26 provides express antecedent basis for the recitation of step (c2) in claim 36. Withdrawal of the rejection is respectfully requested.

Rejection under 35 USC §103 in view of Carruthers et al. and EP '126

Claims 11, 12, 16-19, 21, 23-25, 28-40, and 45 are rejected as allegedly being obvious in view of Carruthers et al. (US 3,691,066) and EP 0 725 126. This rejection is respectfully traversed.

In response to applicants' prior arguments, the Examiner argues that the references are not to be treated separately. However, applicants' arguments were not directed to the individual references, but to their combination. The arguments concerning the deficiencies of the references demonstrated that no motivation exists for combining the references as suggested in the rejection.

For example, as noted previously, Carruthers et al. make no disclosure or suggestion of subsequent treatment of the effluent from the selective hydrogenation by subjecting the effluent to a separation step such as to provide at least three fractions, a light fraction, a heavy fraction and at least one intermediate fraction. Carruthers et al. disclose that the effluent of their process can be used as a gasoline component or as a feedstock for further hydrogenation. See column 3, lines 5-9.

Carruthers et al.'s process is directed toward taking advantage of the finding that selective hydrogenation over a nickel catalyst of a feedstock with a relative high amounts of mercaptans can occur when the mercaptans are caused to react with diolefins to form thiophenes. See column 2, lines 8-35. The reduction of mercaptans prevents poisoning of the catalyst. See column 3, lines 13-15. As stated by Carruthers et al., the object is to reduce diolefin content so

as to render the product stable. See column 3, lines 1-4.

No indication can be gleaned from the Carruthers et al. disclosure of subject the effluent from the process to a separation step. The product effluent is intended to be stable, and Carruthers et al. specifically disclose that it can be used as a gasoline component. Thus, Carruthers et al. provides no motivation to lead one of ordinary skill in the art to subject the effluent to a separation process such as disclosed by Shigeto et al. (EP '126).

Similarly, while Carruthers et al. disclose that its reduction in mercaptans improves quality, no further steps to treat/remove any sulfur compounds is suggested. For example, there is no suggestion of separating the effluent into a light fraction, from which substantially all sulfur compounds are removed, and a heavy fraction, containing most of the initial sulfur compounds, and then subjecting the heavy fraction to a catalytic procedure whereby sulfur compounds are at least partially decomposed or hydrogenated.

Of course, Carruthers et al. also do not disclose or suggest any steps to treat the fractions coming from a separation step, since no separation is suggested. Thus, there is no suggestion of treating an intermediate fraction derived from the effluent of the selective hydrogenation to a procedure whereby sulfur and nitrogen are removed. Nor is there any suggestion of combining any of the fractions derived from the effluent of the selective hydrogenation, wherein at least one of the fractions is desulphurized.

Carruthers et al. also is also devoid of any suggestion of subjecting the effluent from the selective hydrogenation to a procedure whereby the effluent is contacted with the catalyst to decompose sulfur compounds, before any such separation. Compare Applicant's step (c2) as recited in, for example, claim 13. The rejection is apparently relying on the Carruthers et al. disclosure for process steps prior to separation. Yet, the rejection makes no allegation as to why one would modify the Carruthers et al. process as to provide for treating effluent from the selective hydrogenation prior to separation.

As discussed in the prior Reply, the hydrogen treating rate in the process of Carruthers et al. is 1504-37,600 mol/m³. This corresponds to 36-902 liters hydrogen per liter of feedstock (compare, e.g., applicants' claim 11). Furthermore, Carruthers et al. disclose that the hydrogen consumption rate is typically much lower, i.e., 1128-3,760 mol/m³. See column 3, lines 18-21.

Thus, Carruthers et al. clearly suggest using an excess of hydrogen.

The Examiner argues that the hydrogen consumption rates in the Carruthers et al. process is within the hydrogen feed rate recited in applicants' claims, and that it would be obvious to use a hydrogen feed rate equivalent to the hydrogen consumption rate. But, this is not what Carruthers et al. teach. Instead, Carruthers et al. clearly and undeniably teach using an excess of hydrogen. The alleged modification stated by the Examiner contradicts the teaching of Carruthers et al. Thus, there is no motivation for making the modification asserted by the Examiner.

Moreover, compare applicants' comparative example 1 and examples 2 and 3. In comparative example 1, the ratio of hydrogen to feedstock was high, i.e., 150 l/l. Conversely, in examples 2 and 3, the ratio of hydrogen to feedstock was much lower, i.e., 10 l/l. In comparative example 1, the sulfur content of the light gasoline fraction was 220 ppm. Conversely, in examples 2 and 3, the sulfur content of the light gasoline fraction was only 20 ppm. Thus, the higher hydrogen feed rate led to a detrimental effect on mercaptan removal.

Clearly, Carruthers et al., with their teaching of using higher hydrogen feed rates and an excess of hydrogen during the selective hydrogenation, provide no suggestion of a process in accordance with, for example, applicants' claim 11.

Shigeto et al. (EP '126) does not disclose a process involving selective hydrogenation of a gasoline feedstock containing sulfur compounds, diolefins, and olefins. Thus, as with the disclosure of Carruthers et al., EP '126 does not suggest performing selective hydrogenation using a hydrogen/feedstock ratio of 8-30 liters/liter. Hence, the rejection presents no motivation to modify the process of Carruthers et al. so as to arrive at an embodiment of, for example, applicants' claim 11.

EP '126 discloses a process for hydrodesulfurizing catalytically cracked gasoline, which contains sulfur compounds and olefins, whereby the sulfur compounds are removed and reduction of the olefin content is minimized. Thus, the feedstock in EP '126 is a catalytically cracked gasoline, not a catalytically cracked gasoline which has been suggested to a prior selective hydrogenation process.

In the process of EP '126, the catalytically cracked gasoline feedstock is separated into a

plurality of fractions (e.g., by distillation). At least one of these fractions is a fraction is rich in sulfur compounds that are hard to desulfurize. A second fraction is rich in sulfur compounds that are easy to desulfurize.

As discussed above, in the process of Carruthers et al., the feedstock is subjected to a process whereby the mercaptans are converted to thiophenes. Neither Carruthers et al. nor EP '126 provide any motivation for treating such a previously treated feedstock to an elaborate separation process such as disclosed by EP '126, with its initial determination of sulfur compound distribution and subsequent selection of an appropriate distillation system, for separating the feedstock into fractions containing different types of sulfur compounds for separate treatment. Nothing suggests that the effluent from the Carruthers et al. process, which has been specifically treated to reduce the types of sulfur compounds present, should be subjected to a process such as disclosed in EP '126 which is directed toward treating feedstock with a wide variety of sulfur compounds present.

Further, EP '126 does not disclose separating the feedstock to provide a light olefin fraction, from which substantially all the sulfur compounds have been removed, and a heavy fraction in which most of the sulfur compounds initially present within the gasoline feedstock are concentrated. Similarly, EP '126 does not disclose a process wherein a stream is separated into four fractions, i.e., a light fraction, a heavy fraction and two intermediate fractions, and wherein one of the intermediate fractions is combined with a heavy fraction in which most of the initial sulfur compounds are concentrated, before that heavy fraction is contacted with a catalyst to at least partially decomposed or hydrogenate sulfur compounds. In EP '126, the combining together of fractions following the separation step occurs after the hydrodesulfurization procedure is performed. Compare applicants' claims 16 and 20.

Thus, the process of EP '126 is complex involving analysis of the feedstock to decide how to perform the distillation and the analysis of the resultant cuts to decide which fractions are to be desulfurized. This is no motivation to modify the Carruthers et al. process so as to combine it with the complicated process of EP '126.

In view of the above remarks, it is respectfully submitted that Carruthers et al., taken above or in combination with EP '126, fails to render obvious applicants' invention. Withdrawal

of the rejection is respectfully requested.

Rejection under 35 USC §103 in view of Carruthers et al., EP '126, and Cecil et al.

Claims 13-15, 20, 26, 27, and 41-44 are rejected as allegedly being obvious in view of Carruthers et al. (US 3,691,066), EP 0 725 126, and Cecil et al. (US 3,732,155). This rejection is also respectfully traversed.

The disclosures of Carruthers et al. and EP '126 are discussed above. Cecil et al. (US '155) describe a process wherein a hydrocarbon feed containing sulfur compounds is contacted with sulfur-resistant catalysts and progressively desulphurized in a combination of steps. In the initial step, the feed is contacted with catalysts while in the presence of hydrogen and thereby partially desulphurized. In a subsequent step, the feed is contacted with a catalyst, without hydrogen, and thereby desulphurized. See, Column 3, lines 1-11.

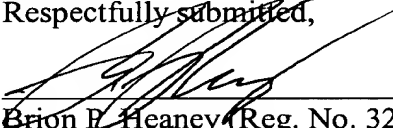
US '155 does not overcome the discrepancies in the disclosures of Carruthers et al. and EP '126, as discussed above. Nor is there any suggestion that the two-step desulphurization procedure described by US '155 would be suitable for use in treating the particular fractions obtained by EP '126, i.e., of either a fraction that is rich in sulfur compounds that are easy to desulphurize or a fraction that is rich in sulfur compounds that is hard to desulphurize.

The examiner argues that US '155 discloses that virtually any sulfur-containing feedstock can be used in its process. This, however, does not provide motivation to modify either US '066 or EP '126. The mere ability to modify a disclosure does not, in and of itself, establish obviousness. See, e.g., *In re Laskowski*, 10 USPQ2d 1397 (Fed. Cir. 1989). Instead, there must be set forth some motivation for making the alleged modification. No sufficient motivation is presented in the rejection.

In view of the above remarks, it is respectfully submitted that Carruthers et al., taken alone or in combination with EP '126 and/or US '155, fails to render obvious Applicants' claimed invention. Withdrawal of the rejection under 35 U.S.C. §103 is respectfully requested.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,



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